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ABSTRACT

This paper explores research on use of medication and non-drug interventions to modify the behavior of preschool children with attention deficit hyperactivity disorder (ADHD). It begins by discussing the symptoms of ADHD, neurological differences between children with ADHD and those without ADHD, and expected adolescent and adult outcomes for children diagnosed with ADHD in elementary school. The three categories of psychotropic medication that are used in treating ADHD are reviewed and include anti-depressants, stimulants, and selective serotonin re-uptake inhibitors. The positive effects of Ritalin on academic productivity, associative learning behavior self-control, information processing, sustained attention, task vigilance, and working memory are discussed, along with the negative effects on appetite, falling asleep, growth inhibition, headaches, increased blood pressure and heart rate, stomachaches, stress, and addiction. Research findings on the efficacy of non-drug treatment for preschool children are then reviewed. Findings indicate that parent training programs, home-school notes, token economics, multimodal day treatment programs, social skills training, art therapy, and peer mediation have been effective in treating preschool children with ADHD. The paper closes by urging early intervention at the preschool level to stop the downward spiral of social dysfunction of children with ADHD. (Contains 118 references.) (CR)

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Abstract

Until recently, the majority of research on Attention Deficit Hyperactivity Disorder (ADHD) has focused on school-aged children, partly because many ADHD behaviors are a normal part of child development (Harris, 2000; Teeter, 1998). However, the preschool period may be the most effective time to intervene because this is when "children are beginning to learn to inhibit on command, to attend for long periods, to persist at play, and to become less restless and hyperactive." (Teeter, 1998, p. 82) Interventions (e.g., classroom management, medication, multimodal day therapy and parent training) for school-age children are well documented and efficacious on a group level. Researchers are beginning to tailor these methods for use with young children. Despite the large increase in the use of medication to treat ADHD, pharmacists have not rigorously tested many kinds for efficacy and safety with young children (Jensen, 1998; Zito, Safer, dosReis, Gardner, Bales, & Lynch, 2000). Accordingly, researchers should place a greater emphasis on designing non-drug interventions for this age group (Blackman, Westervelt, Stevenson, & Welsch, 1991). Since the classroom is a structured environment attuned to each child's specific needs, it may be the best place for interventions to occur because it offers many opportunities for children to interact with others in a variety of ways and on a variety of levels.

Attention-Deficit/Hyperactivity Disorder[1] (ADHD) can manifest itself in academic, familial, occupational and social environments by impairing a person's ability to function typically. The American Psychological Association (1994) defines the essence of ADHD as "a persistent pattern of inattention and/or hyperactivity-impulsivity that is more frequent and severe than is typically observed in individuals at a comparable level of development" (p. 78). A positive diagnosis results from meeting additional criteria: some symptoms must exist prior to age seven, a person must function atypically in two or more environments and the dysfunctions are not a result of a developmental disability, a developmentally harmful or inappropriate environment or another psychological disorder (see Appendix 1 for complete diagnostic criteria). A challenge to diagnosing and to understanding ADHD is the behavior and performance of these children varies across activities, setting and time, which causes parents and teachers to interpret the children as willfully defiant (American Psychological Association, 1994; Greene & Barkley, 1996). In 1994 the American Psychological Association estimated between three and five percent of the United States' school-age population had an ADHD diagnosis (about 2 million people). Over the last six years, the estimate has grown to six percent (Teicher, Anderson, Polcari, Glad, Maas, & Renshaw, 2000).

Previously, there was neither a consensus as to what exactly was ADHD nor agreement about its cause. Researchers and theorists viewed ADHD as a cognitive disorder, a motivation disorder, or even a myth (Cherkes-Julkowski, Sharp, & Stolzenberg, 1997). Others considered it be a deficit, a dysregulation or an inefficiency in attention management (Greene & Barkley, 1996). Did it have a pure neurobiological basis (Cherkes-Julkowski et al., 1996)? Was it the

[1] Before 1994, ADHD was called Attention Deficit Disorder with or without Hyperactivity and various other names. The former diagnostic criteria contained the essence of the current criteria. This paper discusses some studies from that era and considers the old Attention Deficit Disorder diagnosis to be the same diagnosis ADHD for purposes of characteristics, description and treatment.

result of environmental actions on a genetic predisposition (Greene & Barkley, 1996)? Was it symptomatic of family dysfunction (Erdman, 1998)? Did it result from an insecure attachment relationship (Stiefel, 1997)? Did it result from pre- or postnatal environmental toxins, like food additives, fluorescent lights and sugar, or teratogens like alcohol, lead and nicotine (Cherkes-Julkowski et al., 1996)?

During the 1990s, researchers assembled hard evidence of neurological differences between children with ADHD and those without ADHD. Using functional magnetic resonance imaging relaxometry while preadolescent male subjects completed a computerized attention test, researchers have discovered differences in the basal ganglia, specifically the putamen's level of inactivity (Teicher et al., 2000). Additionally, there may be less of a degree of asymmetry between its right and left sides (Rapoport, 1996). Another area of focus is the frontal lobes. Children with ADHD may have smaller anterior regions (Rapoport, 1996). The question remains as to which occurs first: neurological abnormalities or ADHD symptoms.

Despite the debate over the genesis of ADHD, researchers agree on its effects, as listed under Criterion A of the Diagnostic and Statistical Manual for Mental Disorders, 4th edition. These include a frequent difficulty to organize activities and tasks, a high frequency of off-task behaviors, a frequent state of physical or verbal restlessness and a high frequency of interrupting others (see Appendix 1 for complete diagnostic criteria). Additionally, there are several commonly occurring behaviors and relational patterns, such as bossiness, demoralization, excessive insistence on others to meet demands, a low tolerance for frustration, mood lability, poor self-esteem, rejection by peers, stubbornness and temper outbursts. These effects and symptoms often result in antagonistic or resentful family relationships. (American Psychological Association, 1994).

Attention deficit hyperactivity disorder is not confined to childhood. In their literature review, Greene and Barkley (1996) delineated the expected adolescent and adult outcomes for children diagnosed with ADHD in elementary school. Grade retentions are common, especially if the child has comorbid Conduct Disorder or Oppositional Defiance Disorder. Up to thirty-five percent may also have a diagnosed learning disability. The same number may not complete high school. Between twenty and fifty percent may have antisocial tendencies. Additionally, their rates of traffic accidents and violations may be four times higher than the general population. Many continue their high rates of intrafamilial conflict to their intimate adult relationships (Ratey, Hallowell, & Miller, 1995). Thus, the familial and personal costs of ADHD become societal costs.

Researchers also agree a definitive test for identifying ADHD does not exist. A diagnosis results from how parents, psychologists and teachers view the child's behaviors. Many checklists exist to aid the process, such as the Child Behavior Checklist, the Conners' Parent and Teacher Rating Scales and the Preschool and Kindergarten Behavior Scales (Merrell & Wolfe, 1998; Shelton, Barkley, Crosswait, Moorehouse, Fletcher, Barrett, Jenkins, & Metevia, 1998). Although the lists are an attempt to quantify behaviors, and thus, standardize the diagnostic process, they rely on the qualitative observations of individuals who may have different levels of tolerance for hyperactivity, impulsivity and inattention (Robins, 1992).

A common method of treating ADHD is to provide psychotropic medication for the individual (Barkley & Murphy, 1991). There are three categories of psychotropic medication: anti-depressants, stimulants and selective serotonin re-uptake inhibitors. It is possible for an individual to take medication from more than one category. The categories have different, but sometimes overlapping, effects on one or more of the neurotransmitters dopamine,

norepinephrine and serotonin (Cherkes-Julkowski et al., 1997). The fifty or so neurotransmitters, by carrying messages between nerve cells, are the chemical basis of emotion, memory and thought. Neurotransmitters, as the biological controls of reactive and impulsive behavior, are the seeds and core of psychiatric problems, like Antisocial Personality Disorder, Conduct Disorder and Oppositional Defiant Disorder. Low levels of dopamine and serotonin directly influence aggression, hostility and violence by mediating the exhibition of these behaviors. Norepinephrine regulates arousal. High levels of norepinephrine indicate a person is extremely responsive to low amounts of stimulation and requires external constraints because of an inability to self-regulate behavior. Low levels of indicate a person needs high amounts of stimulation to achieve a basic response. (Agatstein, 1999)

Most children with ADHD take the stimulant methylphenidate[2] (brand name: Ritalin) (Zito, Safer, dosReis, Gardner, Boles, & Lynch, 2000). Ritalin directly affects dopamine, norepinephrine and serotonin levels (Cherkes-Julkowski et al., 1997). It stimulates the central nervous and respiratory systems by changing the cerebral cortex and subcortical structure. Common results are a diminished sense of fatigue, increased states of mental alertness and of motor activity and state of mild euphoria (McEvoy, 2000). Studies have documented Ritalin's positive influences on academic productivity, associative learning, behavior self-control, information processing, sustained attention, task vigilance and working memory (Barkley & Murphy, 1991; Cherkes-Julkowski et al., 1997). As the stimulant medication begins to alter the child's deficits in neurological functioning, parents and teachers are able to decrease their frequency of negative control over the child's behavior (Barkley & Murphy, 1991).

[2] Since Ritalin has been used for more than 25 years and the others only have become prominent (or into existence) during the last decade, the vast majority of research on the efficacy of medication on children with ADHD has only considered this drug. Accordingly, this paper will use Ritalin as the drug of choice for treating ADHD.

As with any drug there may be negative side effects and Ritalin has no shortage of them. The two most common are appetite suppression and difficulty falling asleep. Other common results are growth inhibition, headaches, increased blood pressure and heart rate, stomachaches and stress (Barkley & Murphy, 1991). A less commonly discussed, but real, side effect is addiction for prescribees and non-prescribees (Garland, 1998; Levitz, 1999; Stein, 1999). An additional uncertainty is the influence of medication on neurological development. Only in the last few years have researchers have begun to study the influences of psychotropic medications on the developing brain (Vitiello, 1998).

Although the United States Food and Drug Administration has not approved Ritalin and many other psychotropic medications for use by children under the age of six years, many young children do receive them (Grinfeld, 1998; Rappley, Gardiner, Mullen, Wang, & Alvarez, 1998; Zito et al., 2000). In 1994 doctors wrote 3,000 prescriptions for Prozac, which became a treatment for ADHD in the 1990s, for children under the age of one (Grinfeld, 1998). In a fifteen month period in 1995 and 1996, fifty-seven percent of the 223 children under age four diagnosed with ADHD on Michigan Medicaid roles received a psychotropic medication, usually methylphenidate or clonidine (Rappley et al., 1998).

Preschool children who receive Ritalin tend to display a higher frequency and a greater intensity of adverse consequences, including social withdrawal, than older children (Firestone, Musten, Pisterman, Mercer, & Bennett, 1998; Handen, Feldman, Lurier, & Murray, 1999; Zito et al., 2000). Another frequently prescribed drug for ADHD, clonidine, has known health risks, such as causing an irregular or a rapid heart rate (Zito et al., 2000). Scientists have not

conducted any large-scale psychopharmacology studies of this population.[3] Although many studies have included a few preschoolers as the low end of the age range to prove the efficacy of a specific regimen, researchers do not separate results by age level, thus, it is unknown for which subjects the regimen worked and for which subjects the intervention failed (Aman, Kern, Osborne, & Tumuluru, 1997; Fischer & Newby, 1991; Klorman, Brumaghim, Fitzpatrick, & Borgstedt, 1994). Consequently, there is a paucity of efficacy data for medicinal treatment plans, both short- and long-term, for children under age seven. The National Institute of Health is beginning to correct this deficiency (Harris, 2000).

A study of three states depicted the increasing trend of psychotropic prescriptions during the early 1990s (Zito et al., 2000). Researchers tallied Medicaid prescription claims in a Mid-Western state and a Mid-Atlantic state and health maintenance organization (HMO) pharmacy records in a Northwestern state in 1991, 1993 and 1995 (see Table 1 for results). The Mid-Atlantic state, which had the largest fluctuation of enrollees (19,395 vs. 11,691 vs. 215), had the lowest increase in methylphenidate use (170% vs. 300% vs. 310%) and the second lowest rise in total antidepressants use (190% vs. 220% and 130%). Although this study did not investigate the reasons for prescribing these drugs (an ADHD diagnosis is not required), the majority of ADHD treatment plans use stimulants and antidepressants (Barkley & Murphy, 1991).

Table 1: Psychotropic Drug Use by Two-, Three- and Four-Year-Olds in Three States, 1991-1995 (rate per 100) (Zito et al., p. 1027)

	Mid-West State Medicaid				Mid-Atlantic State Medicaid				Northwest State HMO			
No. of Enrollees	146,369-158,060				34,842-54,237				19,107-19,322			
	1991	1993	1995	Increase	1991	1993	1995	Increase	1991	1993	1995	Increase
Stimulants, total	.41	.76	1.23	3	.49	.71	.89	1.8	.17	.33	.51	3.1
Methylphenidate (% of total)	.37 (90)	.71 (93)	1.11 (90)	3	.45 (92)	.59 (83)	.75 (84)	1.7	.13 (76)	.28 (85)	.40 (78)	3.1
Antidepressants, Total	.14	.21	.32	2.2	.09	.14	.16	1.9	.05	.06	.07	1.3

[3] Between 1975 and 1999, there were seven controlled studies of the effects of Ritalin on preschoolers involving 186 children (Greenhill, 1998; Handen et al., 1999). Five studies had a high efficacy rate. Two studies did not report any side effects while two reported higher rates than for school-age children.

Despite the increase in prescription rates, medication only works for fifty to eighty percent of the prescribed population (DuPaul, Eckert, & McGoey, 1997). As such, Ritalin has many critics who tend to present case studies of children who did not respond to Ritalin. Possibly, they were misdiagnosed or never diagnosed with ADHD, in which case Ritalin would have a minimal positive effect. They counter using Ritalin with parent training programs of their own design (Block, 1996; Breggin, 1998; Garber, Garber, & Spezman, 1996; Hunter, 1995; Reichenberg-Ullman & Ullman, 1996; Stein, 1999; & Wright, 1997).

Peter S. Jensen, the Associate Director, Child and Adolescent Research, National Institute of Mental Health, has argued it is unethical to prescribe psychotropic medications as a first response for young children.[4] Although pharmaceuticals may be useful in some cases, doctors know too little about them. He urged parents to use behavioral and psychotherapeutic interventions before using psychotropic medications (Jensen, 1998).

There are many long-standing, efficacious non-drug treatment strategies for school-age children and adult populations, like classroom management practices (e.g., positive tangible and verbal reinforcements, peer reinforcement, reprimands, school-home notes, time-outs and token economies), cognitive-behavioral techniques, correspondence training, multimodal day programs, parent and teacher training programs and specific teaching styles (Abramowitz & O'Leary, 1991; Cherkes-Julkowski et al., 1997; Teeter, 1998). These interventions are well documented and relatively efficacious on a group level. However, individual responses vary, possibly as a result of the function of the specific ADHD-behaviors manifested (DuPaul & Ervin, 1996). Recently, researchers have begun to determine which techniques will also work for children under age six.

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[4] For the purposes of this paper, the term "young children" refers to those under the age of six.

Attention Deficit Hyperactivity Disorder affects a person's ability to function normally in multiple environments. Usually, the first to notice atypical levels of hyperactivity, impulsivity and inattention are family members. Parents of children at all age levels with ADHD report deriving less comfort and value from being a parent, feeling less knowledgeable and skilled, having higher levels of stress and using more authoritarian and negative controls than their counterparts whose children do not have an ADHD diagnosis (Anastopoulos, Barkley, & Shelton, 1996; Erdman, 1998; Winsler, Diaz, McCarthy, & Bird, 1997). Consequently, these parents have a greater risk for experiencing depression and marital discord (Anastopoulos et al., 1996). Many programs exist for parents to learn the best ways of handling their ADHD children such as the ones offered by anti-Ritalin advocates (Block, 1996, Breggin, 1998; Garber et al., 1996; Hunter, 1995; Reichenberg-Ullman & Ullman, 1996; Stein, 1999; & Wright, 1997). Even pro-Ritalin advocates have created parent training programs, like Barkley's Parent Training Program for Defiant Children (1987, 1997).

Despite the success of training programs for parents of children with ADHD, improvements in child behavior within the family do not significantly transfer to school or to other environments (Abikoff & Hectman, 1996; Anastopoulos et al., 1996; Beyer, 1994; McCain & Kelley, 1993). Anastopoulos and colleagues (1996) posit such programs work because they lower parental stress by teaching them to regard disruptive behaviors as less severe than previously thought. The teaching of skills to ignore minor missteps is a common element in parental training programs (Barkley, 1987 & 1997; Stein, 1999).

Beyer (1995) used Barkley's Parent Training Program for Defiant Children (1987) to teach parents of thirty-one, ADHD-diagnosed children (ages 3-11) how to manage their child's behavior. Nineteen children were receiving medication concurrently. Beyer condensed the

normal eight to ten sessions into seven sessions, which included educating about ADHD, managing inappropriate public behavior, ignoring minor misbehavior, improving positive attending skills and using token economies at home. She proved group training was as efficacious as individual family training and the program worked for noncompliant and hyperactive behaviors. It also improved the behavior of children on medication. However, the program did not have a significant effect on classroom behavior according to the twenty-five teachers who responded to questionnaires (Child Behavior Checklist, Connors' Teacher Rating Scale and School Situations Questionnaire) about the children's behavior. Although there was one three-year-old, one four-year-old and five five-year-olds (totaling 23% of sample), Beyer did not report results by age level, thus, leaving open to question which subjects scored below the mean on the improvement measurement tools. Thus, the odds of this program benefiting preschoolers are unknown.

The parent training programs identified and described above are post-onset treatments that teach methods of managing the frequency of ADHD-behaviors. Alonso-Mahoney (1998) described a program (entitled First-Step) which had recognized the need for an early intervention system for at-risk infants and toddlers before aversive child-parent interactions became ingrained and hard to change. Children with ADHD have a 25.1 percent chance for a first-degree relative to also have ADHD, as compared to only a 4.6 percent chance for non-ADHD children who do not have a history of psychiatric referrals (Beiderman, Faraone, Keenan, Knee, & Tsuang, 1990). Additionally, retrospective studies have shown that children later diagnosed with ADHD have a long history of hyperactivity, impulsivity and inattentiveness (Weiss & Hechtman, 1986). Families were eligible for services if the target child (between six months and thirty-six months of age) registered as "difficult" on either the Infant Temperament Questionnaire or the Toddler

Temperament Scale or had a sibling over the age of three diagnosed with ADHD or could be diagnosed and if one parent met the criteria for ADHD according to the Adult Attention Deficit Disorders Evaluation Scale. First-Step used an ecological approach to psychosocial intervention, which is the current theoretical model for treating mental disorders. The program consisted of twelve weekly individual and group family sessions to address the emotional, environmental, psychological and social aspects of the participants' lives. First-Step educated parents about child development, the expected problematic behaviors at each stage and how to manage such behaviors. Participants received additional family and marital therapy, home visits and social work assistance on an as-needed basis. Ideally, establishing boundaries in the home will translate to the creation of and the adherence to self-imposed behavioral limits in other environments. Unfortunately, Alonso-Mahoney did not provide efficacy data to validate the treatment protocol that expanded on successful parent training programs for school-age children.

Parent training only treats one of the many environments of which a child is a part. One method of connecting conduct at home with conduct at school is to create a system of communication between the two (Abramowitz & O'Leary, 1991). Although several parent training programs include a session on using daily report cards, also called school-home notes (Barkley, 1997; Stein, 1999), researchers have conducted only one trial explicitly with young children diagnosed with ADHD (McCain & Kelley, 1993). The idea is for the parents, the student and the teacher to define which behaviors to rate daily and what the consequences and rewards they will offer at home and at school. Sometimes the teacher fills in the note and sometimes the student does.

McCain and Kelley (1993) tested the efficacy of home-school notes on Mitch, a five-year-old with ADHD whose parents had completed successfully a parent training program. His

behavior had improved at home but not at school. Because Mitch attended an all-day preschool, his daily report card had a morning and an afternoon component. The same target behaviors were in each section: "Played Well with Others," "Followed Directions," "Picked Up Toys," and "Used Classtime Well." The teacher circled a smiley face, a so-so face or a sad face depending on Mitch's behavior during the daily, fifty-minute free-play periods. The faces replaced letter grades, the meaning of which Mitch did not seem to comprehend. Additionally, if Mitch remained at an activity for a pre-determined amount of time, he could earn up to five smiley faces, which he colored. When the intervention began, the required time was five minutes. As Mitch improved, he was able to remain on-task (interactive play) for up to twenty minutes. However, Mitch needed a timer as a reinforcement to remain on-task. Another change during the experiment was the increase in the number of smiley faces earned and the decrease in the number of so-so and sad faces earned to receive home-based rewards, such as a special activity or snack.

McCain and Kelley (1993) judged the success of Mitch's treatment not only by the number of smiley faces earned but also by observing the free-play periods throughout the five week program length. Observers recorded every fifteen seconds whether Mitch was on- or off-task, being disruptive or had changed activities (see Table 2 for results). During the second baseline condition, the teacher told Mitch it would be few days before more copies of the report card could be made, however, he would still receive rewards at home. Mitch's on-task and disruptive behavior rates were variable during both baseline phases and were steadier during treatment phases. His number of activity changes were steady during Baseline Two (6, 6, 6 & 5) versus Baseline One (8, 6, 5, 10, 8, & 10). The changes in Mitch's behavior were readily apparent to all and everybody reported satisfaction with the program. However, McCain and

Kelley did not specify when the observations occurred: only in the morning, only in the afternoon or during both sessions. Despite Mitch's success, no one has published a replicated case trial or conducted a large-scale trial of this treatment protocol.

Table 2: Average Frequency of Target Behaviors Displayed (McCain & Kelley, 1993, 40-42)

	Baseline 1 (Days 1-6)	Treatment 1 (Days 7-13)	Baseline 2 (Days 14-17)	Treatment 2 (Days 18-25)
On-task Behavior (%)	57	85	59	84
Disruptive Behavior (%)	29	7	33	9
Activity Changes (#)	8	2	6	2

Another non-drug treatment method, which works for school-age children, is token economies. The system can work positively (child earns points for appropriate behavior, called positive reinforcement) and negatively (child loses points for inappropriate behavior, called response cost). Depending on what and how the child, the parents and the teacher want to accomplish, the token economy may function on a positive basis only, a negative basis only or both together. Generally, the teacher prominently displays the tokens (objects, points, smiley/sad faces, etc.) in the classroom to serve as a non-verbal prompter for appropriate behavior. Small rewards are available at specific times throughout the day and at the end of day or week to maintain student interest.

McGoey (1997) conducted the first study of a token economy with preschoolers diagnosed with ADHD. She compared the effectiveness of positive reinforcement and response cost token economies on classroom social behavior. Four participants, two boys and two girls, attended a public school's pre-kindergarten program with about twenty students and one teacher aide in each class. Because of teacher preference, McGoey used an ABACABAC design for the two boys and an ACABABAC design for the two girls with follow-up phases continuing for two to three weeks. The entire program lasted about two months.

At the beginning of each day, teachers reviewed general classroom rules of behavior. During positive reinforcement phases teachers rewarded students with small buttons, placed on a displayed chart, each time the child followed established classroom rules. At the end of each activity, the students were eligible for a large button. If the children accumulated enough large buttons throughout the day, teachers offered inexpensive rewards (crayons, markers, stickers, etc.) before dismissal. During response cost phases, the chart was full at the beginning of the day and children lost buttons due to misbehavior. They still needed a specific number of large buttons at the end of the day to receive rewards. Each time the teachers added or removed a button, they explained the exact reason for their action in the form of praises or reprimands.

The study also compared the subjects' behavior against matched peers (who represented average teacher-expected behavior) by using direct observation at least three days per week for twenty minutes at fifteen-second intervals, with every fifth interval for peer observation. Observers recorded how many times students disobeyed and followed classroom rules, engaged in negative and positive social interactions, played near and with others, threw temper tantrums and were off-task. McGoey (1997) chose these dependent measures as the best ways to judge compliance and impulse inhibition. Over time, the average frequency of negative social behaviors lessened, despite some daily spikes (see Table 3 for the frequency of negative behavior). During the second positive reinforcement phase, the two girls [Rebecca (3%, about 8%, about 17%), Monica (0%, 30%, 33%)] had upward trends. Monica's mean (21%) was higher than her initial baseline (20%). During the post-experiment interview, Monica reported not enjoying receiving buttons for good behavior. Her subsequent baseline decreased fifty-two percent. McGoey theorized another type of token might have produced a positive response because Monica may have acted out to demonstrate her disapproval.

Table 3: Mean Frequency (%) of Negative Social Interactions (McGoey, 1997, pp. 55-73)

	BL	PR	BL	RC	BL	PR	BL	RC	F[b]
Derek	20	2	6	4	9	1	3	1[a]	0
Peer	7	0	**8**	0	0	0	0	0	0
Douglas	19	4	7	3	17	2	7	2[a]	2
Peer	3	0	**4**	0	0	0	0	0	0
	BL	RC	BL	PR	BL	PR	BL	RC	F[b]
Monica	20	4	**22**	7	9	**21**	11	1[a]	1
Peer	6	**8**	**6**	**18**	2	0	**8**	0	0
Rebecca	24	17	**32**	9	**24**	9	17	2	12
Peer	2	1	2	0	0	0	2	0	0

BL= Baseline; PR= Positive Reinforcement Intervention; RC= Response Cost Intervention; F= Follow-up
Bolded numbers indicate levels higher than initial baseline levels of negative behavior.
[a] The day before one observation the class went on a field trip and the day after was a scheduled vacation day. The teacher stated the whole class behaved atypically, thus, that day's data are not included (negative behavior rate: Derek about 25%; Douglas about 40%; Monica about 10%).
[b] Teachers continued using the response cost token economy but not the positive reinforcement token economy. Number of observations during this phase: Derek-1; Douglas-2; Monica-2; Rebecca-2.

This study used two teacher-rated behavior measurement tools [Preschool and Kindergarten Behavior Scales (PKBS) and ADHD Rating Scale-IV (ADHD-IV)] to determine specific changes during each phase (see Table 4 for results). The PKBS is comparable to the Conners Teaching Rating Scale-Revised, the Matson Evaluation of Social Skills with Youngsters and the Social Skills Rating System. The PKBS measures social skills (34 items covering cooperation, independence, interaction) and problem behaviors (42 items on anti-socialness/aggressiveness, anxiety/somatic problems, attention problems/overactivity, self-centeredness/explosiveness and social withdrawal). Respondents rate each behavior occurrence as never, rarely, sometimes or often true. For the Social Skills component, higher scores are better, while lower scores are better for the Problem Behaviors component. Scores for both components reflected positive improvement, which stabilized toward the end of the experiment. (McGoey, 1997; Merrell, 1996)

The ADHD-IV has eighteen items relating to the American Psychological Association's Diagnostic and Statistical Manual-IV criteria for diagnosing ADHD (see Appendix 1 for

complete diagnostic criteria). The scale has two components, Inattention and Hyperactivity/Impulsivity for which lower scores (range 0-27) are better. Respondents rate each behavior occurrence as never, rarely, sometimes or often true. The ADHD-IV has not been normed for children under the age of five. Although the two girls (one was more volatile) tended to have higher scores than the two boys, scores for both components reflected positive improvement, which stabilized toward the end of the experiment.

Table 4: Results of Teacher Rating Scales (McGoey, 1997, pp. 60-61)

	BL	PR	BL	RC	BL	PR	BL	RC	F[a]
Derek									
PKBS									
SS/PB	99/111	120/80	115/110	120/84	114/84	120/78	119/77	120/76	120/75
ADHD-IV									
I/H-I	14/22	1/5	8/8	5/2	6/8	5/1	4/3	4/1	1/0
Douglas									
PKBS									
SS/PB	104/102	120/85	**80/107**	118/83	112/85	119/82	116/84	119/83	119/85
ADHD-IV									
I/H-I	10/15	3/3	9/14	3/7	6/7	0/6	5/7	1/3	3/5
	BL	**RC**	**BL**	**PR**	**BL**	**PR**	**BL**	**RC**	**F[a]**
Monica									
PKBS									
SS/PB	95/123	115/86	106/94	115/83	113/95	115/83	114/88	119/81	116/84
ADHD-IV									
I/H-I	18/24	3/6	5/9	4/6	7/8	5/6	5/7	2/4	4/4
Rebecca									
PKBS									
SS/PB	82/131	108/103	86/121	102/105	87/113	104/110	96/122	108/107	103/111
ADHD-IV									
I/H-I	19/25	5/10	13/15	4/9	13/14	11/10	14/14	6/9	4/10

BL= Baseline; PR= Positive Reinforcement Intervention; RC= Response Cost Intervention; F= Follow-up
PKBS= Preschool and Kindergarten Behavior Scale; SS= Social Skills Total Standard Score (high scores are better); PB= Problem Behavior Total Standard Score (low scores are better)
Bolded numbers indicate lower/higher ratings than initial baseline ratings of Social Skills/Problem Behaviors.
ADHD-IV= ADHD Rating Scale-IV; I= Inattentive Scale; H-I= Hyperactive/Impulsive Scale
[a] Teachers continued using the response cost token economy but not the positive reinforcement token economy.

Although the teachers regarded both interventions as appropriate, beneficial, effective, likable, non-adversive and transferable to other behaviors and students, they gave slightly higher marks to the response cost treatment. Using either intervention required the teacher and aide to be aware of the child's activities. However, with up to nineteen other students in the room, one teacher remarked it was harder to "catch the child being good." (McGoey, 1997, p. 84)

Meanwhile, teachers more easily learned about or spotted negative behavior. During both response cost treatments, the students responded with unhappy faces or remarks to losing a button. Conversely, earning buttons during the first positive reinforcement phase excited them. However, during the second positive reinforcement phase, the students, especially the girls, became less affective when given buttons. McGoey hypothesized the procedure had become routine and had lost its appeal. Additionally, one child reported not enjoying earning buttons. All believed their teachers to be fair although the students felt they were a little less fair during the response cost phase.

Despite the success in achieving the stated goals of McGoey's (1997) study (comparing the effectiveness of positive reinforcement and response cost token economies and determining student and teacher acceptability), the results may not be generalizable. First, McGoey did not reveal if the children were in a half-day or full-day program. Second, although the observations lasted for only twenty minutes out of an entire day of treatment, McGoey did not report at what time the observations occurred or even if they occurred at the same time across the experiment. These two weaknesses do not provide for changes in behavior over the course of one day. Third, the number of observations was not uniform for all children. Fourth, in the analytical process, prosocial behaviors became the inverse of negative behaviors although observers recorded them as well as the rate of solitary play (counted as a neutral experience), which the analysis ignored. McGoey did not report if her subjects were receiving Ritalin or any other medicine. Children with ADHD who take Ritalin tend to increase their rates of solitary play from pre-Ritalin rates, possibly due to their increased ability to concentrate on one activity (Gadow, Nolan, Sverd, Sprafkin, & Psolicelli, 1990). Thus, the question remains if positive behaviors replaced all negative behaviors or if children had a decrease in the total number of interactions. Fifth,

although McGoey reported before the experiment teachers lectured the subjects about inappropriate behavior, she did not report if they used any negative consequences, like time-out, either before, during or after the experiment. Sixth, although the children's behavior improved and stabilized from the experiment's beginning to its end on all dependent measures, McGoey did not report if the results were statistically significant. Overall, this experiment is an important first step in using specific, classroom behavior management strategies to influence the behavior of preschoolers diagnosed with ADHD. Future research should not only attempt to replicate the findings but also to expand the knowledge base about a few elements, such as combining positive reinforcement and response cost token economies (McGoey has reservations as to children's understanding and if the practice would be developmentally appropriate) and testing other types of chart markers like stickers.

Another method of decreasing the number of ADHD-behaviors displayed in classrooms is to enroll the child in a multimodal day treatment program, such as the one described by Pelham & Hoza (1996). The program lasted nine hours per day, five days per week for eight summer weeks. Although this program focused on improving peer relationships through recreational group activities,[5] it included an academic program (3 hours per day in art, a child-chosen academic subject, and computers). Instructors used daily report cards, positive verbal reinforcements, time-outs and token economies to manage behavior. After completing the summer phase, the children met every other Saturday for booster sessions throughout the next school year, while program staff consulted with teachers. Additionally, the parents attended group training sessions on behavior management throughout the year. Although the program has existed since 1980, investigators have not rigorously evaluated it. Pelham and Hoza conducted

[5] This function will be detailed below.

parent satisfaction surveys for three years in the early 1990s. All who responded rated the program as beneficial with eighty percent declaring it very beneficial for their child. This program enrolled children as young as five. However, the authors did not separate results by age, thus, leaving open to question for which subjects the treatment was less effective.

Despite the success in modifying the behavior of children with ADHD, the standard treatments of behavior management techniques and medication do not address one's ability to develop and maintain peer relationships (Pelham & Hoza, 1996). The development of social skills is as important as the development of cognitive skills, because social involvement is a component of effectance, or mastery, motivation, which is "the desire for enjoyment of competently engaging in and mastering challenging tasks." (Barnett, 1997, p. 157)

Grunebaum and Solomon (1980) contend playing with peers serves two socializing functions. First, it develops social skills, such as learning the rules of how to and how not to participate.[6] Second, it helps control aggressive tendencies by using rough-and-tumble play. During the preschool years, children increase their rates of cooperative play and are mutually responsive, yet emotionally ambivalent toward others (Grunebaum & Solomon, 1982). Teachers should watch how children with ADHD play (e.g., how they interact with peers) because problems with self-regulating behavior can affect cognitive and emotional development which enhances the odds for rejection by peers, which has devastating personal and societal consequences (Alessandri, 1992). Peers and teachers tend to regard socially rejected children as more aggressive. These children are likely to develop higher rates conduct disturbances, grade

[6] March was the peak incidence (during January, February, March and April 2000) of my preschool class asking to involve themselves with others [more specifically, for others to "share" (i.e., "hand over") a toy] with "I'll be your best friend." When the other child denied the request, the first responded "Then, I'm not your best friend!"

failures, juvenile delinquency, school drop-outs and substance abuse during adolescence (Ollendick, Weist, Borden, & Greene, 1992).

Researchers have identified several common social characteristics of hyperactive children, whether or not diagnosed with ADHD. Riddle and Rapoport (1976) learned hyperactive boys treated with Ritalin at age eight to have low peer status two years later, even if they were no longer receiving medication or considered to be hyperactive. Pelham and Bender (1982) found hyperactive elementary school children usually have an aggressive, bossy and bothersome style of interaction that results in peer dislike. Alessandri and Schromm (1991) presented a case study of a four-year-old male with ADHD. They characterized his low levels of sustained attention during freeplay and structured group activities as a developmental delay in his ability to play. Whalen and Henker (1991) declared many children with ADHD have volatile social interaction styles in form and in intensity. At times they may appear aloof to others' social actions. At other times, they can exhibit styles of social busyness and clumsiness that peers may perceive as immature or intrusive. Additionally, Whalen and Henker reported anecdotal evidence of peers typically choosing hyperactive children last when selecting players for team sports. Alessandri (1992) observed twenty preschoolers diagnosed with ADHD and twenty matched undiagnosed preschoolers during freeplay sessions and structured music and story times over a six week period. The ADHD subjects exhibited less functional motor play, had impaired play and social interactions and were less attentive and cooperative during group activities. Additionally, these children were less compliant and less responsible during clean-up times. Erhardt and Hinshaw (1994) examined the sociometric ratings of forty-nine summer camp participants (all elementary school-age boys). The primary determinants of negative ratings for ADHD subjects were aggression and noncompliance. However, the one-to-one ratio of ADHD

to non-ADHD children may have skewed the ratings. Abikoff and Hechtman (1996) determined children with ADHD have levels of neutral and positive interactions commensurate with peers but abnormally higher levels of negative interaction. Wolfberg and colleagues (1999) reported on a six-year-old male diagnosed with Pervasive Developmental Disorder and Attention Deficit Disorder who attended an inclusive kindergarten. His social initiations were usually of a uniform style, such as repeating "Hi" or providing a running commentary of others' activities. Predictably, the classmates usually disregarded his presence. His infrequent friendships were short-lived and with younger (chronologically or mentally) children. The investigators did not report the degree to which his interaction style resulted from Attention Deficit Disorder.

The above-mentioned social interaction characteristics of ADHD children signify a social learning disability. Whalen and Henker (1991) define this as a condition, which prevents people them "from mastering the subtle yet perpetual decoding, enactment, self-monitoring, and fine-tuning required for effective interpersonal exchange." (p. 231) Medication, at least in the short-term, lessens the frequency of abrasive peer interactions possibly due to increased involvement in solitary activities (Abikoff and Hechtman, 1996; Gadow et al., 1990; Whalen & Henker, 1991). However, without social skills training the already low level of functioning does not rebound (Riddle & Rapoport, 1976; Whalen & Henker, 1991). Abikoff and Hechtman (1996) argue a social skills curriculum should focus on conversational, cooperative and listening skills by teaching ADHD children how to cooperate in group activities, how to give and receive positive feedback, how to join a conversation and how to waif for one's turn during games. Techniques should include modeling and role-playing positive behaviors, videotaping training sessions for review and assigning homework activities.

How many ADHD children have a social learning disability is unknown and relatively unstudied. Greene, Biederman, Faraone, Ouellette, Penn, and Griffin (1996) conducted a survey to estimate the percentage affected. They used parent reports of child and family conflict, of family psychiatric histories, of previous social problems, of social functioning as well as cognitive tests to determine the social functioning of children with ADHD. Subjects (n=226) were mostly male with an age range of six to seventeen (M=11.1). None of the reports of the 107 control subjects revealed a social learning disability, whereas, the study declared twenty-two percent (26/119) of the ADHD children were socially disabled, or more than 1.65 standard deviations below the mean on the study-specific scale. Three-quarters of this subset had a co-morbid major psychiatric disorder (Conduct Disorder, major depression or multiple anxieties). The authors' literature search presented studies that demonstrated poor social functioning could lead to increased aggression and conduct problems which cause in an increased risk for grade retention, school drop-out, social disturbance and substance abuse. The study found a social learning disability increased the level of family conflict. They further hypothesized that family conflict might increase the level of social dysfunction.

Although children with ADHD tend to improve, but do not function normally, with time, Pelham and Bender (1982) theorized improved positive relations may help ameliorate the long-term effects of ADHD as they do with other mental disorders and developmental disabilities. However, these bonds do not develop spontaneously. Lutfiyya (1988) identified six conditions necessary to create friendships: opportunity, support, diversity, continuity, freedom of choice and opportunities for intimacy. Because ADHD can impair the normal developmental process of social skills, educators should consider those affected to have a special need. Unfortunately, many children with special needs (CWSN) are unable to initiate and to sustain peer-level

communications although they may demonstrate higher levels of functioning with family or with teachers (File, 1994; Ostrosky, Kaiser, & Odom, 1993).

This inability worries educators for two reasons. First, Ostrosky and colleagues (1993) argue the coequal nature of child-child relationships (whether with typically developing children (TDC) or with other CWSN) provides an appropriate and dynamic way to learn language and other behavioral and communicative skills. Second, one's ability to communicate can affect one's cognitive development (Barnett, 1997). Children who are more competent are able to invite and to sustain larger amounts of parental interaction, which correlates with increased intelligence (Bradley, Caldwell, & Elardo, 1979; Bradley, 1985). Consequently, many parents of CWSN regard the development of social skills as an important program component in both integrated and segregated settings (Diamond & Le Furgy, 1994; Guralnick, 1994; Guralnick, Connor, & Hammond, 1995).

It is crucial for teachers to develop interpersonal skills in children with specials needs because they tend to be less skilled, and thus have fewer relationships, than typically developing children (Diamond, Le Furgy, & Blass, 1993; File, 1994; Nabors, 1997; Ostrosky et al., 1993; Wolfberg et al., 1999). Good social skills are necessary to develop interpersonal relationships, to express effectively one's choices, desires and emotions and to gather information (Barnett, 1997; Falvey, 1995; Ostrosky et al., 1993). Enduring, positive relationships help create resiliency in children environmentally at-risk for developmental disabilities and for having a bleak future, whether measured by criminal records, economic means, intellectual capabilities, mental health status, occupation level or social functioning (Rothbart, 1989; Werner, 1990).

As Lutfiyya's (1988) conditions for developing friendships imply, proximity alone does not seem not to encourage positive social interactions (Erwin, 1996; Lee & Odom, 1996; Odom,

Chandler, Ostrosky, McConnell, & Reaney, 1992; Snyder et al., 1977). Educators must provide a structure, either environmental or adult-directed, to encourage and sustain communication between children (Odom & Brown, 1993). Environmental conditions include play centers and toys, social density and spatial density. Adult-induced conditions include creating groups, guiding social interactions and training individuals or groups in prosocial behavior. Interventions by adults and peers have the greatest degree of success (Peterson & McConnell, 1996). For children to learn appropriate behaviors, they need good role models, adult-provided reinforcements and training.

The first people children encounter who help them develop social skills are their primary caregivers. The type of attachment relationship, secure or insecure, formed with the primary caregiver greatly contributes to the ease with which children explore the physical and social environment (Chase, 1992). About age one, children begin combining the separate activities of object play and of social play. The level of integration depends on the security of the attachment relationship (Roggman, Carroll, Pippin, & McCool, 1990). At this time, two mental developments typically occur to acquire symbolic, or make-believe, play skills (Fenson & Ramsay, 1980). First, children begin to become less egocentric in their play and other actions. Second, children begin to integrate single activities into combined schemes. For example, a child re-enacts a parent cooking and serving a meal either with play equipment or with other objects and toys standing in for the real items. Jean Piaget characterized this as a transformation from the sensorimotor (physical) stage to the preoperational (conceptual) stage of cognitive development (Piaget, 1962). In the first phase, the child, as an infant, directly imitates the behavior of others. Gradually, during toddlerhood the activities begin to separate from the time of observance.

As the child learns to recall other-directed actions, the child develops its own ideas about the relationships between objects and people. For example, a child may role-play the behavior of a parent or pretend a pot is a helmet. Eventually, symbolic play culminates in playing games with rules. Competent children use objects and people to reinforce their experiences. Rewarding experiences increase communicative, intellectual and social faculties, which fosters the desire for more interactions (Bradley, 1985; Chase, 1992).

The determining factor in developing high intellectual capabilities is a high quality home environment, especially the type of interactions between the child and its primary caregiver, usually the mother. Relationships that (1) have levels of didactic communication; (2) are responsive to the child's desires and needs; and, (3) are low in direction, punishment and restriction seem to be the most promising. A family's income level has an indirect effect on a child's performance, as low levels tend to indicate poorer performance on psychometric tests (Brooks-Gunn & Duncan, 1997; Bryant & Maxwell, 1997).

Attention Deficit Hyperactivity Disorder may prevent having a high quality home environment. Parents of children with ADHD report deriving less comfort and value from being a parent, feeling less knowledgeable and skilled, having higher levels of stress and using more authoritarian and negative controls than their counterparts whose children do not have an ADHD diagnosis (Anastopoulos et al., 1996; Erdman, 1998; Winsler et al., 1997). Some parents interpret the children as willfully defiant because their child's behavior and performance varies across activities, settings and time (American Psychological Association, 1994; Greene & Barkley, 1996). This factor easily adds to these feelings of inadequacy. Because of these stressors, parents have a greater risk for experiencing depression and marital discord

(Anastopoulos et al., 1996). These parental dysfunctions in turn contribute to a lower quality home environment and a cyclical process can soon develop.

One multimodal day treatment program explored "how the family system maintains the child's deviant behaviors" (Grizenko, Papineau, & Sayegh, 1993, p. 129). At intake, children and parents considered their family to operate within normal levels on the Family Assessment Measure. However, during the required family therapy sessions, counselors detected problem areas in the child-parent relationship. Grizenko and colleagues (1993) explained the erroneous self-reports by theorizing families focus on the relationship with the disruptive child and gloss over systemic difficulties.

Erdman (1998), a family therapist, described her ADHD clients' intrafamilial patterns of behavior as resembling those of families with insecure child-parent attachment relationships. A secure bond serves a base for successfully interacting with the world. The three categories of insecure relationships (ambivalent-resistant, avoidant and disorganized-disoriented) reveal themselves by how the child responds to the absence and the return of its primary caregiver while the child stays in an unknown room with a stranger. The child's reaction is a defensive strategy against feelings of isolation. One characteristic of insecure attachment bonds is high rates of child- and parent-initiated coercive interactive behaviors, i.e., a negative control over the other's behavior. Erdman warned against using exclusively child-centered treatments with ADHD children who exhibit symptoms of insecure attachment because doing so would further victimize the child.

Many programs exist, and are successful, for parents to learn the best ways of handling their ADHD children (Barkley, 1987 & 1997; Block, 1996, Breggin, 1998; Garber et al., 1996; Hunter, 1995; Reichenberg-Ullman & Ullman, 1996; Stein, 1999; & Wright, 1997). However,

improvements in child behavior within the family do not transfer at significant levels to school or to other environments (Abikoff & Hectman, 1996; Anastopoulos et al., 1996; Beyer, 1994; McCain & Kelley, 1993). Anastopoulos and colleagues (1996) suggest such programs work because they lower the parents' stress levels by teaching them to regard disruptive behaviors as less severe than previously thought. The teaching of skills to ignore minor missteps is a common element in parental training programs (Barkley, 1987 & 1997; Stein, 1999).

The family is a person's primary social environment. Day care centers and preschools are the first significant transition to the world. Teachers should watch how children with ADHD play (e.g., how they interact with peers) because problems with self-regulating behavior can affect cognitive and emotional development which enhances the odds for rejection by peers, which has devastating personal and societal consequences (Alessandri, 1992). Socially rejected children tend to be regarded as more aggressive by peers and by teachers and develop higher rates of adolescent conduct disturbances, grade failures, juvenile delinquency, school drop-outs and substance abuse (Ollendick et al., 1992).

A small but unknown number children with ADHD manifest aggressive and hostile social behaviors which contribute to social rejection by peers (Pelham & Bender, 1982; Erhardt & Hinshaw, 1994). Erhardt and Hinshaw (1994) examined the sociometric ratings of forty-nine summer camp participants (all elementary school-age boys). The determinants of negative ratings for ADHD subjects were aggression and noncompliance. However, the one-to-one ratio of ADHD to non-ADHD children may have skewed the ratings. The subjects had received medication for at least four months. They did not receive their medication from the weekend before the camp started through the third day. Researchers used four non-behavioral variables (academic achievement, intelligence, motor competency and physical attractiveness) and four

social behaviors variables (aggression, isolation, noncompliance and prosocial action) determined by observations. The study divided the children into two age-based cohorts (6-9 and 9.5-12) and then into two halves, maintaining the one-to-one ratios. On the first and third days, investigators asked the children how much they wanted each boy in their cohort half to be their friend. At the camp's end, researchers repeated the question, which now applied to the whole cohort, as well as asking each boy to pick the three they most and least liked. From the first day, ADHD boys were "overwhelmingly rejected" (p. 833). Although the frequency of their aggressive interactions occurred only six percent of the time, this rate was twice that of non-ADHD boys. For the first two queries, aggressive and noncompliant behaviors together accounted for forty-six percent of the variance. The last query revealed aggression accounted for thirty-two percent of the variance and noncompliance accounted for fifty percent of the variance. Prosocial actions had only a small amount of predictive validity for forecasting friendships.

Not all children with ADHD are aggressive. Historically, investigations to make this determination relied on observations and on psychometric tests. Low levels of the neurotransmitter serotonin are characteristic of aggressive adults. Halperin, Newcorn, Kopstein, McKay, Schwartz, Siever and Sharma (1997) explored the relationship between aggressive and non-aggressive children with ADHD, their serotonin levels and their parents' histories of aggression. A low serotonin level indicated greater odds of behaving aggressively, especially if both the child and at least one parent had a history of such maladaptive behavior.

It remains unknown as to whether serotonin levels are environmentally or genetically determined. Perhaps, children with ADHD resort to aggression because they are living at a faster rate and become impatient either with their unknown inability to communicate adequately or with the slowness of others in understanding requests. Over time, this behavior may become

ingrained and the children may decide it is easier to obtain attention, objects and personal gratification by taking. Cillessen and Hubbard's (1993) investigation of highly and lowly aggressive boys found the highly aggressive ones view their behavior as effective to achieve their goals. Two studies have increased the knowledge base about the connection between ADHD and aggression.

Morgan, Yang and Griego (1998) conducted two studies to determine the relationship between aggression, hyperactivity, impulsivity and mastery motivation in young children. The first study defined mastery motivation as persistence at gross motor activities, at object-oriented activities and at social interactions and the pleasure received from such activities. It used multiple regression analysis to evaluate two maternal report questionnaires (Child Behavior Checklist and Dimensions of Mastery Questionnaire) for 332 preschool-age twins. A positive prediction of aggression (r=.33 for Twin 1 and r=.35 for Twin 2) resulted from maternal ratings of low pleasure while persisting at gross motor activities. A positive prediction of hyperactivity (r=.33 for Twin 1 and r=.48 for Twin 2) resulted from low persistence at gross motor and at object-oriented activities. The second study was an analysis of data collected from 152 normally developing preschoolers evaluated at two times one month apart. The study rated nine factors: attention paid to adults, enthusiasm during testing, involvement in gross motor play, involvement with adults, involvement with peers, length of play bouts, persistence at challenging tasks and play involvement, positive affect over the testing period and vigor while performing motor tasks. A prediction of aggressiveness and negativity toward peers (r=.73) toward peers resulted from a combination of three factors: involvement in gross motor play, involvement with peers and vigor while performing motor tasks. A prediction of impulsivity (r=.77) resulted from a combination of six factors: enthusiasm during testing, involvement with peers, low involvement with adults

and attempts to control them, low persistence at challenging tasks, not paying attention to adult instructions and vigor while performing motor tasks. Because many of the factors analyzed in both studies are prevalent during the normal developmental process, Morgan, Yang and Griego cautioned against not discriminating between high levels of activity, aggression, impulsivity and noncompliance and between abnormally high levels which warrant an evaluation for ADHD.

Lahey and colleagues (1998) used social measures to determine if children under age seven might be over-diagnosed with ADHD using the criteria from the Diagnostic and Statistical Manual, 4th edition (DSM-IV). The DSM-IV provides for three types of ADHD (predominantly inattentive, predominantly hyperactive-impulsive and combined type) depending from which category people have more characteristics (see Appendix 1 for complete diagnostic criteria). Participants were 252 children (ADHD subjects and matched controls), aged four, five and six. All attended a structured educational program: preschool (36%), kindergarten (43%), first grade (21%) and second grade (2%). Of the 126 children diagnosed with ADHD, thirteen were predominantly inattentive, thirty-one were predominantly hyperactive-impulsive and eighty-two had a combination. The investigators queried children, parents and teachers about the quality and types of the subjects' peer interactions. Children completed a modified Loneliness and Social Dissatisfaction Questionnaire (15 items: "no," "sometimes," or "yes") which determined the child's self-perceived levels of friendship. Children with ADHD reported feeling more socially isolated, having more difficulties befriending others and joining in activities (see Table 5 for results). Presumably, peers were more accepting of high levels of activity and impulsivity than inattention, which tends to manifest as short intervals of focus and not waiting turns. Teachers completed the Teacher Assessment of Social Behavior, which measures four domains: Prosocial, Aggressive, Disruptive and Shy/Withdrawn. Responses for each question (three per

domain) could range from "very uncharacteristic" to "very characteristic" on a five-point Likert Scale. All ADHD sub-types were negatively different from their non-ADHD peers, except inattentive children tended to be less aggressive (see Table 6 for results). Teachers also determined the proportion of peers who liked, disliked or ignored/were neutral toward the study participants. All ADHD sub-types were negatively different from their non-ADHD peers (see Table 7 for results). Each point represented twenty percent of the participant's peers. On all measurement instruments children with ADHD rated themselves and were judged by teachers to be less socially adept (e.g., less cooperative, more disruptive and lonelier), which resulted in lower levels of teacher-perceived popularity.

Table 5: Child Reported Friendship Difficulties, $p<.005$ (Lahey et al., 1998, p.700)

Non-ADHD	Inattentive	Hyperactive-Impulsive	Combined Type
6.60	10.40	9.63	10.25

Table 6: Teacher Assessment of Social Behavior Results (Lahey et al., 1998, p.700)

	Non-ADHD	Inattentive	Hyperactive-Impulsive	Combined Type
Prosocial ($p<.0001$)	12.27	10.57	10.56	9.91
Aggressive (not significant)	5.75	5.52	6.3	6.68
Disruptive ($p<.0001$)	8.16	10.21	12.53	13.48
Shy/Withdrawn ($p<.05$)	5.58	6.85	6.19	6.89

Table 7: Teacher-Defined Proportion of Peers who Like, Dislike or Ignore/Are Neutral Toward Each Child (Lahey et al., 1998, p. 700)

	Non-ADHD	Inattentive	Hyperactive-Impulsive	Combined Type
Like ($p<.0001$)	4.26	2.78	3.64	3.06
Dislike ($p<.005$)	1.26	1.39	1.40	1.84
Ignore/Neutral ($p<.0001$)	1.42	2.15	1.90	2.51

Bergen (1994) and Levin (1994) suggest children replicate what they observe, especially in their playstyles, in order to understand what they witnessed in real-life or in various forms of entertainment. However, this imitation may not develop the comprehension necessary to differentiate aggressive and violent acts between entertainment sources and real life (Carlsson-Paige & Levin, 1987). Thus, children learn violence can be an effective conflict-resolution

technique (Bergen, 1994; Cillessen & Hubbard, 1993; Fortis-Diaz (1998). An extensive display of childhood aggression (whether or not expressed during play) foreshadows a socially deviant adolescence and adulthood (Fraser, 1996; Kellam, Mayer, Rebok & Hawkins, 1998; Pakiz, Reinherz, & Giaconia, 1997; Tremblay, Pagani-Kurtz, Masse, Vitaro, & Pihl, 1995). Fortunately, teachers can overcome this environmental training by providing alternatives (Carlsson-Paige & Levin, 1992; Fortis-Diaz, 1998; Oken-Wright, 1992).

The only published study of lessening the occurrence of a young ADHD child's classroom aggression, without the direct application of pharmaceuticals, is a case study of Jack, a six-year-old male kindergartner (Banks, Davis, Howard, & McLaughlin, 1993). Jack had a history of aggression toward classmates (choking, grabbing, hitting, kicking and pushing) and of experiencing intrafamilial violence. Additionally, he exhibited psychosocial coping skill loss and sensory integration problems. His Vineland Adaptive Behavior Scale (domains measured: communication, daily living skills, maladaptive behaviors, motor skills and socialization) score was forty-seven (M=100), three standard deviations below the mean. His delayed social skills qualified him for special services. Additionally, he had difficulty maintaining peer relationships although he had an expressed desired to do so.

This experiment employed the art therapy technique of directed art activities. This method has the subject consider a feeling while performing an art activity, whether coloring, drawing, painting, sculpting, etc. Teacher prompts at the beginning and during the activity are essential to maintain the subject's focus on the feeling. After all students have completed their art work, the teacher leads a class discussion by asking each child two questions: "(Child's name), tell us about your (picture)" and "How do you feel about your (picture)?" (Banks et al., 1993, p. 237)

The class used one art medium for two consecutive days with control and treatment days alternating. On control days, the teacher did not have the children focus on a feeling nor was there a post-activity discussion. To determine effectiveness, Banks and colleagues (1993) counted the incidences of aggression at five minutes and at thirty minutes after completion of the art activity during indoor freeplay time. Observers counted baseline rates during the normal indoor freeplay period. Presumably, any art activities occurred after the observation times.

Table 8: Mean Frequency of Aggressive Behaviors Displayed (Banks et al., 1993, p. 238)

	Baseline (5 days)	Control (6 days)	Treatment (6 days)
5 minutes after	7.8	5	.5
30 minutes after	6.6	5.2	1

Banks and colleagues (1993) considered their experiment to be successful. Although they did not note if the decreased rates of aggression correlated with increased rates of positive peer-initiated or self-initiated interactions. Another child with mental retardation and social delays (although not as severe as Jack) increased his social initiation rates from .2 to 1.6 to 3.4 (means of both 5 minutes post-activity and 30 minutes post-activity observations for baseline, control and treatment days). It is unknown if the experiment used the same sequence of feelings. Researchers should conduct more studies with longer durations and more subjects to determine the exact influence of directed art activities on aggression.

There are three strategies for encouraging social participation by children with special needs (CWSN): adult or peer mediation, attention and responsiveness to the child by the environment or by people and environmental structuring (Cavallaro, Haney, & Cabello, 1993). The first approach directly involves the target child and, consequently, has the greatest degree of success (Peterson & McConnell, 1996). Although adult-induced interventions can improve a child's social skills, this is a time-consuming and costly treatment. Using peers, either with or without special needs, "can enhance the efforts of professionals by expanding the resources and

instructional opportunities available" (Ostrosky et al., 1993, p. 165). First, it reduces the amount of one-on-one instruction. Second, it informally exposes children to peer modeling. Third, it encourages independent social interaction instead of a dependence on teachers to be playmates (see also Graham, 1991).

A broad definition of the term "peer-mediation " is the practice of inclusion. For this procedure to be effective in the long-term, all children should receive training in pro-social behavior (Day, Powell, Eng, & Stowitschek, 1982; Odom & Strain, 1984; Ostrosky et al., 1993; Rauer, Cooke, & Apolloni, 1978). However, the term generally means typically developing children (TDC) have received special training on how to initiate and to sustain communication with children with special needs, whether in integrated classes or in controlled settings.

Kohler and Strain (1990) reviewed several experiments using peer-mediation techniques. From the data, they defined four categories of peer capabilities. First, peers manage the social behaviors of others. Second, peers act as behavior models. Third, peers teach developmental skills. Fourth, peers partake in group-reinforcement training. The first two are the most commonly used categories of peer-mediation. These comprise the technique of training peers to initiate and sustain interactions.

The common method of using peer-mediators is to have special training sessions and to use the new skills in controlled settings. The training sessions teach pro-social techniques, such as asking questions, inviting CWSN to play, persisting in communication attempts, offering assistance and sharing toys. One ingredient in successful experiments is the use of prompts and reinforcements by teachers. Prompts are cues for TDC to initiate or to respond to CWSN. Reinforcements may be posters, praise, review of learned strategies or rewards. However, researchers believe it is necessary for the more direct structures to fade away in order for the

skills to extend into other settings and to exist after the treatment period (Goldstein & Wickstrom, 1996; Lee & Odom, 1996; Odom & Brown, 1993; Odom et al., 1992; Rauer et al., 1978).

Researchers used several of these techniques in an experiment with socially withdrawn, maltreated preschoolers. In this study, peer-mediators produced better results than adult-mediators (Fantuzzo, Jurecic, Stovall, Hightower, Goins, & Schachtel, 1988). These peer-mediators were also maltreated or at risk for maltreatment. This use of CWSN as mediators differed from standard practice. The authors offered no explanation beyond the child-care center being only for maltreated children or those at risk for maltreatment. The study investigated the effect of peer- or adult-initiators and a peer-noninitiator on a dyad, using the dyad alone as a baseline. Peers received training in organizing play activities and sharing. Before the treatment sessions, teachers reminded the peers of their tasks. After the sessions, the peers received praise, which faded throughout the experiment, for their initiations. During the treatment sessions with peer-initiators, the subjects significantly increased their use of oral initiations, oral responses, motor initiations and motor responses. In the classroom (post-treatment), the frequency of occurrences of all behaviors increased but only the increase in oral initiations was statistically significant. With peer-noninitiators, there was an increase, though statistically insignificant, in oral initiations in the treatment setting but not in the classroom, while the other behaviors decreased in both settings. However, the dyads with adult-initiators had decreases in all behavior categories in both treatment and classroom settings. This may have resulted from the socioeconomic level of the targets or because they were unfamiliar with the adults. These findings support Ostrosky and colleagues' (1993) contention that the coequal nature of child-

child relationships is an appropriate and dynamic way to learn behavioral and communicative skills.

The success of peer-mediation depends on the children themselves. Luckily, TDC want to help CWSN develop skills (Bowden & Thorburn, 1993; Hanline, 1993). They imitate adult actions (Erwin, 1996). Also, they can adapt verbally "when necessary during interactions with less skilled peers." (Ostrosky et al., 1993, p.160)

Researchers have conducted two experiments using peers as a mediating influence for children with ADHD (DuPaul, Ervin, Hook & McGoey, 1998; Pelham & Hoza, 1996). However, one program, a class-wide peer tutoring system, was exclusively for elementary school students, grades one through five. The other, a multimodal day treatment program, included an unspecified number of kindergartners and no preschoolers. Future studies should build on the body of literature already compiled for using preschoolers and kindergartners as mediators.

The class-wide peer tutoring experiment focused on improving academic performance in one subject, math or spelling, which ever was the subject's (n=18) weaker class. The instructional techniques and the procedural components reflected tactics known to be beneficial for ADHD children. Each week teachers introduced a new concept after administering a pre-test on Mondays. All students took turns tutoring each other for twenty minutes a day. On Fridays, students took another test to evaluate their progress. ADHD students gained an average twenty-two percent increase in scores, compared to thirteen percent during baseline conditions. The study considered one-half of the target children to have demonstrated academic success. Researchers hypothesized the difference between success and failure was if the child had worked on challenging material. All the successful ones had, while all but one of the failures had not. (DuPaul et al., 1998)

The investigators hoped the individualized attention would cause changes in active on-task behavior, passive on-task behavior and off-task behaviors. Teachers regarded peer tutors as frequent exhibitors of appropriate classroom behaviors. Teachers rated control children as displaying an average number of appropriate classroom behaviors. Treatment phases lasted either one or two weeks. Observers visited classrooms at least three times per week and recorded the target behaviors every fifteen seconds for fifteen to twenty minutes. The class-wide peer tutoring system significantly reduced the rates of off-task behavior for both subjects and controls. The authors reasoned the corresponding changes in average off-task behavior for the controls indicated "it is not the disability that is critical, but how an educational environment is arranged." (DuPaul et al., 1998, p. 589)

Table 9: Off-Task Rates (%) of Occurrence (DuPaul et al., 1998, p.586)

	Baseline 1	Treatment 1	Baseline 2	Treatment 2
Subjects	27	8	24	6
Controls	10	1	9	2

The multimodal day treatment program described by Pelham and Hoza (1996) focused on improving peer relationship skills as one way to decrease the number of ADHD-behaviors displayed in classrooms. The program lasted nine hours per day, five days per week for eight summer weeks. This program used recreational group activities and three hours of academic instruction (art, a child-chosen subject and computers). Instructors used daily report cards, positive verbal reinforcements, time-outs and token economies to manage behavior. Participants attended social skills training classes and learned group-problem solving skills. However, the primary arena for developing peer interaction expertise occurred during sports practices and games. Program designers chose sports because children socially rejected other children for immature or inadequate play skills. Boys may be more in need of this emphasis because society expects boys to be good athletes. ADHD interferes with this ability because its symptoms are

not compatible with following rules, with good motor skills and with periods of personal inactivity while maintaining attention on distant action. For example, Lucy from *Peanuts* never intentionally catches the baseball in the outfield.

Although the program has existed since 1980, investigators have not rigorously evaluated it. Pelham and Hoza conducted parent satisfaction surveys for three years in the early 1990s. All who responded rated the program as "at least somewhat beneficial" with eighty percent declaring it to be "very beneficial" for their child (Pelham & Hoza, 1996, p. 331). This program enrolled children as young as five. However, the authors did not separate results by age, thus, leaving open to question for which subjects the treatment was less effective. Pelham and Hoza mentioned the beginning of a "buddy system" program to increase the number of social interactions. This method may work extremely well for preschoolers by providing them with a dedicated partner for many activities instead of for only one activity like DuPaul and colleagues' (1998) class-wide peer tutoring system.

Attention Deficit Hyperactivity Disorder prevents a person from functioning normally in all environments: home, school, social and work. This impairment can last throughout a person's life. Between twenty and fifty percent of people with ADHD have a severe dysfunction resulting in antisocial behaviors (Greene and Barkley, 1996). These behaviors, especially aggression and noncompliance, can lead to social rejection by others (Alessandri, 1992; Ollendick et al., 1992). Social isolation further increases the odds of a bleak future, whether measured by criminal records, economic means, intellectual capabilities, mental health status, occupation level or social functioning (Rothbart, 1989; Werner, 1990).

The preschool period may be the most effective time to stop the downward spiral of social dysfunction because this is when "children are beginning to learn to inhibit on command,

to attend for long periods, to persist at play, and to become less restless and hyperactive." (Teeter, 1998, p. 82) Interventions (e.g., classroom management, medication, multimodal day therapy and parent training) for school-age children are well-documented and efficacious on a group level. Researchers are beginning to tailor these methods for use with young children. Despite the large increase in the use of medication to treat ADHD, pharmacists have not tested rigorously many kinds for efficacy and safety with young children (Jensen, 1998; Zito, Safer, dosReis, Gardner, Bales & Lynch, 2000). Accordingly, educators and researchers should place a greater emphasis on designing non-drug interventions for this age group (Blackman, Westervelt, Stevenson, & Welsch, 1991).

Researchers have conducted only three non-medication experiments which exclusively focused on improving the social functioning of young children diagnosed with ADHD (Banks et al., 1993; McCain & Kelley, 1993; McGoey, 1997). Banks and colleagues (1993) used the art therapy technique of direct art activities to reduce a male kindergartner's frequent displays of aggressive behaviors. McCain & Kelley (1993) connected behavior at school with negative and positive consequences at home in an effort to transfer a boy's prosocial behaviors to multiple environments. McGoey (1997) experimented with token economies to provide and to remove tangible benefits for following and for not following classroom rules. Although the experimenters judged these programs to be successful, two case studies and a four-child sample are not enough to create a reliable treatment protocol. In addition to replicating these studies, researchers should test different variables to create a regimen that is adaptable for all young children with ADHD. Furthermore, the investigators adapted these programs from techniques proven to work with older children. Researchers must try other efficacious strategies.

Another experiment that focused exclusively on young children was First-Step (Alonso-Mahoney, 1998). This program targeted a family in which at least one parent met the criteria for an ADHD diagnosis. The goal was to intervene before aversive child-parent interactions became ingrained and hard to change. First-Step used an ecological approach to psychosocial intervention, which is the current theoretical model for treating mental disorders. The program addressed the emotional, environmental, psychological and social aspects of the participants' lives. First-Step educated parents about child development, the expected problematic behaviors at each stage and how to manage such behaviors. Although Alonso-Mahoney did not provide efficacy data for the program, First-Step is a promising beginning for an early intervention strategy. Ideally, establishing boundaries in the home will translate to the creation of and the adherence to self-imposed behavioral limits in other environments.

A last area of further study is the use of social skills training for all students. Good social skills are necessary to develop interpersonal relationships, to express effectively one's choices, desires and emotions and to gather information (Barnett, 1997; Falvey, 1995; Ostrosky et al., 1993). Unfortunately, many children with special needs are unable to initiate and to sustain peer-level communications although they may demonstrate higher levels of functioning with family or with teachers (File, 1994; Ostrosky et al., 1993). This inability worries educators for two reasons. First, Ostrosky and colleagues (1993) argue the coequal nature of child-child relationships provides an appropriate and dynamic way to learn language and other behavioral and communicative skills. Second, one's ability to communicate can affect one's cognitive development (Barnett, 1997). Children who are more competent are able to invite and to sustain larger amounts of parental interaction, which correlates with increased intelligence (Bradley, Caldwell, & Elardo, 1979; Bradley, 1985). Mandatory social skills training programs will not

only help children at-risk for being socially disabled and those already dysfunctional it will insure the success of typically developing children.

Abikoff and Hechtman (1996) argue a social skills curriculum should focus on conversational, cooperative and listening skills by teaching ADHD children how to cooperate in group activities, how to give and receive positive feedback, how to join a conversation and how to wait for one's turn during games. Techniques should include modeling and role-playing positive behaviors, videotaping training sessions for review and assigning homework activities. As the classroom is a structured environment attuned to each child's specific needs, it may be the best place for such interventions to occur because it offers many opportunities for children to interact with others in a variety of ways and on a variety of levels.

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Appendix 1
DSM-IV Diagnostic Criteria for Attention-Deficit/Hyperactivity Disorder[7]

A. Either (1) or (2):
   (1) six (or more) of the following symptoms of **inattention** have persisted for at least 6 months to a degree that is maladaptive and inconsistent with developmental level:

Inattention

   (a) often fails to give close attention to details or makes careless mistakes in schoolwork, work, or other activities
   (b) often has difficulty sustaining attention in tasks or play activities
   (c) often does not seem to listen when spoken to directly
   (d) often does not follow through on instructions and fails to finish schoolwork, chores, or duties in the workplace (not due to oppositional behavior or failure to understand instructions)
   (e) often has difficulty organizing tasks and activities
   (f) often avoids, dislikes, or is reluctant to engage in tasks that require sustained mental effort (such as schoolwork or homework)
   (g) often loses things necessary for tasks or activities (e.g. school assignments, pencils, books, tools, or toys)
   (h) is often easily distracted by extraneous stimuli
   (i) is often forgetful in daily activities

   (2) six (or more) of the following symptoms of **hyperactivity-impulsivity** have persisted for at least 6 months to a degree that is maladaptive and inconsistent with developmental level:

   Hyperactivity:
   (a) often fidgets with hands or feet or squirms in seat
   (b) often leaves seat in classroom or in other situations in which remaining seated is expected
   (c) often runs about or climbs excessively in situations in which it is inappropriate (in adolescents or adults, may be limited to subjective feelings of restlessness)
   (d) often has difficulty playing or engaging in leisure activities quietly
   (e) is often "on the go" or often acts as if "driven by a motor"
   (f) often talks excessively

   Impulsivity:
   (g) often blurts out answers to questions before the questions have been completed
   (h) often has difficulty awaiting turn
   (i) often interrupts or intrudes on others (e.g.., butts into conversations or games)

B. Some hyperactive-impulsive or inattentive symptoms that caused impairment were present before age 7 years.
C. Some impairment from the symptoms is present in two or more settings (e.g., at school, work, home)
D. There must be clear evidence of clinically significant impairment in social, academic, or occupational functioning.
E. The symptoms do not occur exclusively during the course of a Pervasive Developmental Disorder, Schizophrenia, or other Psychotic Disorder, and are not better accounted for by another mental disorder (e.g., Mood Disorder, Anxiety, Dissociative Disorder, or a Personality Disorder).

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[7] American Psychological Association. (1994). *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.). Washington, D.C.: Author. (p. 83-85).